Project Manager's Quarterly Progress Report – 2nd Quarter FY 2001
U.S. Large Hadron Collider Construction Project

1. PROJECT IDENTIFIERS

Reporting Period:	Through **March 31, 2001**
Program Sponsors:	DOE High Energy Physics Division/NSF Physics Division
DOE/NSF Program Manager:	T. Toohig, (301) 903-4115, timothy.toohig@science.doe.gov
DOE/NSF Associate Program Manager:	M. Goldberg, (703) 306-1894, mgoldber@nsf.gov
Operations Office:	Chicago Operations Office/Fermi Area Office
DOE/NSF Project Manager:	J. Yeck, (630) 840-2530, jim.yeck@ch.doe.gov

2. PROJECT DESCRIPTION

The Department of Energy (DOE) and the National Science Foundation (NSF) have signed agreements committing to collaboration in the construction of the Large Hadron Collider (LHC) at CERN (European Laboratory for Particle Physics) and two of its associated detectors. The U.S. fabrication effort will be carried out at, or under the supervision of, U.S. universities and national laboratories under the terms and conditions described in the International Collaboration Agreement (Agreement) and its Accelerator and Experiments Protocols. The U.S. LHC Construction Project is defined by the goods and services to be provided to CERN under the terms of the Agreement between DOE, NSF, and CERN. These goods and services include DOE contributions to the LHC accelerator, and DOE and NSF contributions to the ATLAS (A Toroidal LHC Apparatus) and CMS (Compact Muon Solenoid) experiments.

The DOE contribution to the LHC accelerator consists of items provided by DOE National Laboratories and CERN direct purchases from U.S. industrial firms. The scope of these contributions is addressed in the Accelerator Protocol and described in detail in an Implementing Arrangement between the collaborating DOE National Laboratories and CERN. The DOE and NSF contributions to the ATLAS and CMS detectors consist of items supplied by the collaborating U.S. universities and DOE National Laboratories. The scope of these contributions is addressed in the Experiments Protocol and described in detail in Memoranda of Understanding for collaboration on construction of each experiment.

The U.S. LHC Construction Project includes the U.S. ATLAS, U.S. CMS, and U.S. LHC Accelerator projects. This report summarizes the overall status of the U.S. LHC Construction Project effort and includes more detailed status information on each sub-project. Additional information can be accessed at the following web sites:

U.S. LHC Project - http://www.hep.net/doe-hep/lhc.html

LHC Project - http://wwwlhc.cern.ch/	U.S. LHC Accelerator - http://www-td.fnal.gov/
ATLAS - http://atlasinfo.cern.ch/Atlas/Welcome.html	U.S. ATLAS - http://www.usatlas.bnl.gov/
CMS - http://cmsinfo.cern.ch/Welcome.html	U.S. CMS - http://uscms.fnal.gov/

3. PROJECT MANAGER'S NARRATIVE HIGHLIGHTS

The current list of DOE/NSF project reviews and status meetings is provided below. The results of these activities are documented in formal reports and meeting notes. The U.S. CMS and ATLAS projects submit monthly reports and the U.S. LHC Accelerator project submits a quarterly report:

U.S. LHC Construction Project	Event	Date
U.S. CMS Detector	Quarterly Status Meeting	January 25, 2001
U.S. LHC Accelerator	Quarterly Status Meeting	February 12, 2001
U.S. ATLAS Detector	DOE/NSF Review	March 20-22, 2001
U.S. CMS Detector	DOE/NSF Review	May 8-10, 2001
U.S. LHC Accelerator	DOE/NSF Review	May 13-14, 2001
U.S. ATLAS Detector	Quarterly Status Meeting	June 20, 2001

Current performance data is summarized in the following tables:

Table 3.1, Schedule Performance Indices

	Planned Complete (BCWS/BAC)	Actual Complete (BCWP/BAC)	Schedule Performance (BCWP/BCWS)
U.S. ATLAS	41%	40%	99%
U.S. CMS	60%	54%	88%
U.S. LHC Accelerator	64%	59%	92%

Table 3.2, Contingency Status (in thousands of dollars)

	Total Project Cost (TPC)	Budget at Completion (BAC)	Contingency	Budgeted Cost of Work Performed (BCWP)	Remaining Work to be Performed (BAC-BCWP)	Contingency/ (BAC-BCWP)
US ATLAS	163,750	133,812	29,938	53,849	79,963	37%
US CMS	167,250	138,225	29,025	74,027	64,198	45%
US Accelerator	110,000	96,655	13,345 *(6,919)	57,078	39,577	34% *(17%)

* (based on revised Estimate to Complete under review)

Table 3.3, Cost & Schedule Performance (in thousands of dollars) Indices

	Cumulative Costs to Date					Costs at Completion		
	Budgeted Cost			Variance			Revised	
	Work Scheduled	Work Performed	Actual Cost	Schedule	Cost	Budgeted	Estimate	Variance
U.S. ATLAS	54,331	53,849	53,587	-482	262	163,750	163,750	0
U.S. CMS	83,954	74,027	64,554	-9927	9473	167,250	167,250	0
U.S. LHC Accelerator	62,134	57,078	62,698	-5056	-5620	110,000	110,000	0
CERN Invoices	22,721	22,721	22,721	0	0	90,000	90,000	0
U.S. LHC Total	223,140	207,675	203,560	-15465	4115	531,000	531,000	0

4. PROJECT MANAGER'S ASSESSMENT

The U.S. projects continue to meet their goals and are reliable and influential partners in the construction of the ATLAS and CMS detectors and the LHC machine.

Cost – Cost performance is good as material contracts are typically below estimates and labor costs continue to track close to plans. Each project maintains an adequate level of contingency.

Schedule - Schedule performance is measured through milestone completion and by earned value. These measurements indicate that schedule progress is slightly behind plans averaging about ninety-two percent of the baseline plan. CERN expects to complete construction of the LHC in 2005 and initiate collider commissioning. The U.S. schedules are consistent with this goal.

Technical – We remain confident that the U.S. deliverables to CERN can be realized with the planned funding. The U.S. LHC Construction Project deliverables are accepted by CERN and approved by the DOE/NSF Joint Oversight Group. We expect to provide additional items to CERN, within the approved funding, should cost performance be favorable.

ISSUES

LHC Schedules – CERN has agreed on a new schedule for the machine, with the ring closed/cold by 12/05, first collisions/pilot run starting 4/06, followed by a 3 month shutdown and first physics starting 8/06. Both experiments are revising and reworking initial detector configuration and installation plans with the goal of initial detectors ready for first collisions and complete detectors (with staging options) ready for the first physics run. ATLAS is completing a detailed, multi-phased installation scenario taking into account the delay in the availability of the underground cavern. CMS is planning and identifying resource issues associated with moving more assembly, testing and installation activities from the underground to the surface facility. DOE and NSF staff continue to closely monitor this planning activity.

ATLAS and CMS Resources– Estimates of the resources required to complete the experiments exceed the funding currently identified, as discussed at the April '01 Resource Review Board (RRB) meeting. Funding shortfalls are driven by several factors: various institutes not meeting their original commitments, improved estimates of the funding required to complete the detectors, cost overruns on core items, exchange rate problems, and (mainly for CMS) civil construction delays. At the RRB meeting, both collaborations and CERN indicated that they will work with the international Funding Agencies to seek additional resources, or develop appropriate work-around plans for completing the detectors. CMS and ATLAS are currently ~50% complete. Experiment and civil construction cost status will be presented to the CERN Council and further addressed in December 2001.

Radiation Hard Electronics - Significant challenges remain in the development of radiation hard electronics for the ATLAS and CMS experiments including production yields and limited

vendor options. Export license and dual-use technology issues are additional complications.

5. NARRATIVE SUMMARY

5.1 U.S. ATLAS CONSTRUCTION PROJECT

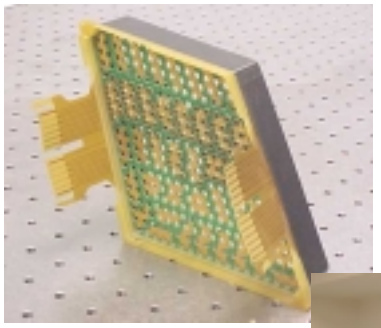
ATLAS International –The Collaboration is working on a plan to assure a viable detector for the initial collisions at LHC, taking into account current technical, schedule and resource constraints. In ATLAS management, the new Resource and Technical Coordinators officially took office. Most detector subsystems are well into the construction phase, and those not yet are close to it, and fabrication of large time-critical components of the Common Projects (magnets, Liquid Argon cryostats) is well underway. Other ATLAS highlights are summarized below:

- Work on the Barrel Toroid, the second component in the ATLAS installation sequence, matches current installation dates, with superconductor, vacuum vessel, coil and other major component fabrication and procurement making good progress.
- End-Cap Toroid superconductor, cold mass and vacuum vessel fabrication and procurement are also making good progress; End-Cap Toroid tests have been reorganized to be conducted in parallel with Barrel Toroid tests to gain efficiencies.
- The level-1 trigger subsystem (calorimeter, muon and central processor logic) continues to progress well, implementing advances in technology as well as improvements following detailed studies recently completed.

U.S. ATLAS - The overall project, as of March 31, 2001 was actually 42.7 percent complete versus the 43.1 percent planned. A DOE/NSF review was conducted at Brookhaven National Laboratory on March 20-22, 2001. The U.S. collaboration has made good technical progress and no major technical issues were identified. Most U.S. ATLAS subsystems are in production, and radiation-hard electronics issues continue to receive attention. Schedule status indicates that U.S. ATLAS should meet ATLAS need dates. Listed below are project highlights:

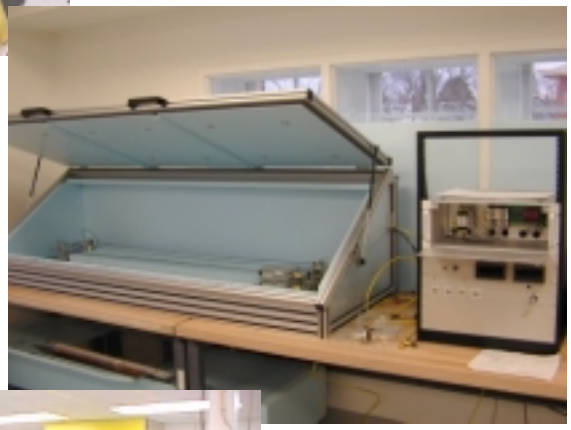
- The U.S. ATLAS Project completed a revised cost estimate, including establishing the pixel subsystem as part of the approved baseline.
- TRT Mechanics: Mechanical production processes were reviewed in a production audit (shells, foam cutting and wire stringing). Processes restarted after incorporation of necessary production changes into final assembly procedures and database systems.
- LAr: The cold test of the Barrel Cryostat met requirements of the "Specification and the Final Test Acceptance", completing the fabrication activities at Kawasaki.
- Tile: The contract for fabrication and assembly of the motherboards was signed in January, the first sample production of 5 sets of boards should be available by April.
- Muon: Good cosmic ray tracks were recorded in EIL1 - Module 0 at the Boston Muon Consortium. The chamber was fully instrumented with prototype readout cards and High Voltage and all the tubes function. The chamber will be placed on the cosmic test tower and a detailed program started to determine the key chamber parameters. This achievement marks the transition from a raw tube assembly to a working chamber.

U.S. ATLAS Transition Radiation Tracker (TRT) Production (below)…

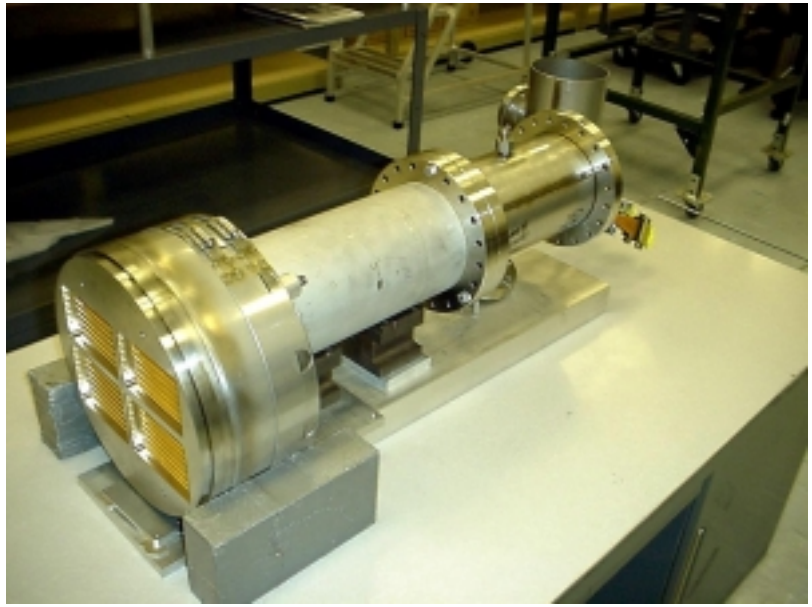


Left- TRT wire joint station unit at Duke University.

Right- TRT component prep and straw subassembly at Hampton University.



Left- TRT Shell production at Indiana University.



Above- A Signal Feedthrough for the Liquid Argon Electromagnetic Calorimeter, produced at BNL. Sixty-four feedthroughs will be produced, with production underway at 1-2 feedthroughs/week, and 35 feedthroughs expected to be shipped to CERN by the end of May.

5.2 U.S. CMS CONSTRUCTION PROJECT

CMS International – CMS has made plans for a complete detector (except for a fourth Endcap Muon station) ready for the first physics run in 2006. CMS is evaluating options to move underground installation and commissioning work to the Surface Building. CMS magnet work is progressing well, and most detector subsystems are in mass production, ramping up production, or will start production later this year. Some CMS highlights are summarized below:

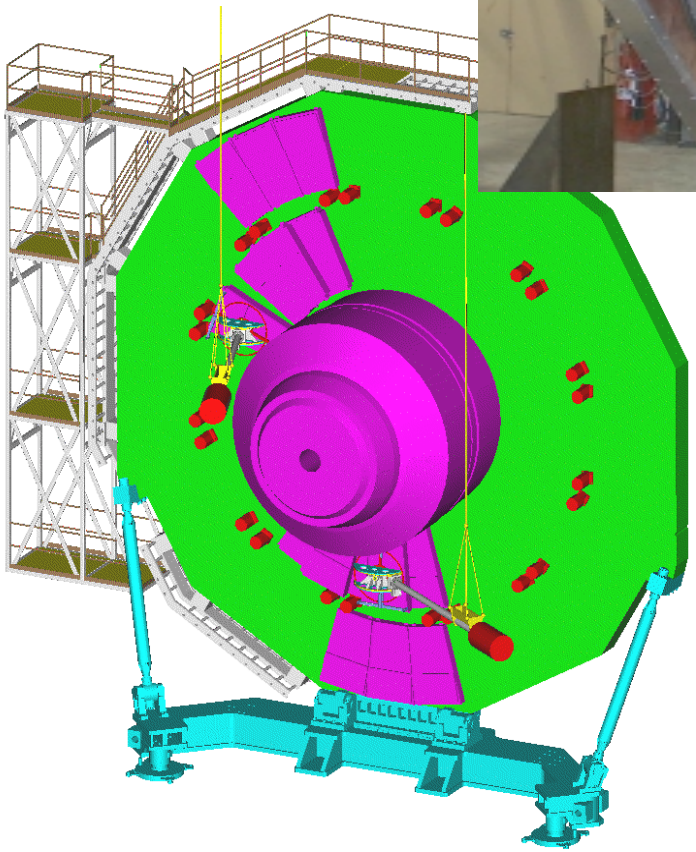
- Most major contracts (86%) for the CMS magnet have been placed, and total cost remains unchanged; 3 of the 5 magnet barrel yoke rings are assembled at Point 5.
- Breakthroughs in crystal growing in Russia will allow two crystals for the Electromagnetic Calorimeter to be cut from one ingot, allowing greater yield than planned.
- Hadron Calorimeter (HCAL) Endcap Absorber has been manufactured and assembled in Minsk, Russia; the second half of the HCAL Barrel Absorber is under manufacture in Felgura, Spain.
- LHC Committee has recommended approval of the CMS Level-1 Trigger Technical Design Report.

U.S. CMS – As of March 31, 2001, the overall U.S. CMS Construction Project was 54% complete vs. the scheduled 60% complete. A DOE/NSF Quarterly status meeting was held on January 25, 2001 at the University of Minnesota to focus on the electromagnetic calorimeter system, and the DOE/NSF review was conducted May 8-10, 2001 at Fermilab. U.S. CMS is performing well with respect to technical and cost goals, while schedule remains a closely monitored issue. Progress is being made with calorimeter and muon system electronics on the critical path affecting further production of some items. Listed below are project highlights:

- Production of Muon system Cathode Strip Chamber (CSC) panels is proceeding at the desired rate and cost to support CSC chamber production at Fermilab, with CSC panel production 50% complete and chamber production 25% complete; tooling for final assembly and testing of chambers at Russia and China CSC production sites is being constructed and shipped.
- Production of Hadron Calorimeter (HCAL) scintillator tiles at Fermilab is on schedule, and more than half complete; a review of the technically challenging HCAL Readout Box was conducted, resulting in approval to proceed with production.
- Trigger prototyping program is proceeding well, with successful completion of the calorimeter trigger serial link tests of copper cable at 4 Gbit/sec, and successful testing of logic and communications between muon trigger Port, Sector Processor, and Sector Receiver units.
- Electromagnetic calorimeter (ECAL) electro-optical components and fiber assemblies parts for prototypes have been delivered; ECAL avalanche photo-diodes (APDs) design has been improved, and APDs have exhibited 100% survival rate after neutron irradiation studies.
- Silicon Tracker subsystem statements of work and MOU's are proceeding, with advanced procurements of equipment in process, and additional resources joining the effort, such as U-C Santa Barbara and others.

Below- Computer model showing Endcap Muon Integration and Installation design and procedure work.

Right- Endcap Muon Cathode Strip Chamber Installation Fixture, designed by the University of Wisconsin , shown demonstrated at Fermilab.



Below- Probing Station for Silicon Tracker pre-production activities at Kansas State University (KSU recently joined U.S. CMS).

Below- Gantry for assembly of Silicon Tracker modules, recently delivered to Fermilab.

5.3 U.S LHC ACCELERATOR CONSTRUCTION PROJECT

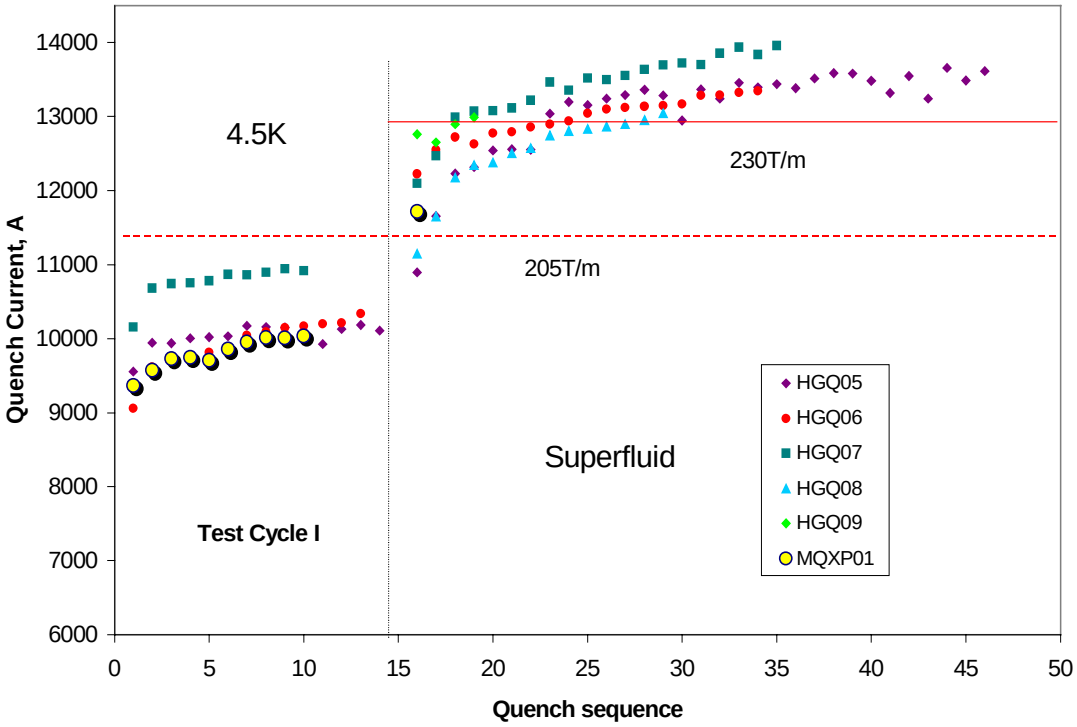
LHC – The new commissioning schedule has been agreed upon, with important dates as follows: first octant test- 4/04; last dipole produced-4/05; rings cold-12/05; first beam-2/06; pilot run-4/06; shutdown-5-7/06; physics run-8/06. The CERN Director-General has chaired a series of joint LHC Machine-Detector meetings to provide a regular forum for mutual planning between the accelerator and experiments.

- The first LHC dipole test results were very satisfactory, with first quench near the nominal operating level (8.34 Tesla), and no further quench when the magnet was powered to the ultimate field limit (9 Tesla).
- Cryogenic dipole assembly call for tender is out, with adjudication expected by September; contracts for all main components of dipoles are now placed and series production has started, but slow progress by superconducting cable vendors continues to pace the dipole program.
- CERN and the U.S. are working together as necessary to achieve tighter configuration management, as final designs are translated into production of components.

U.S. LHC Accelerator - As of March 31, 2000, the overall project was 59% percent complete versus the scheduled plan of 64% percent complete. A DOE/NSF Quarterly Status meeting was held at BNL on February 12, 2001 with the next DOE/NSF review schedule for May 14-15, 2001, at Fermilab. The level of contingency available in the project has emerged as a minor concern, due to recently identified growth in costs associated with the latest estimate to complete. Project management is fully evaluating project scope and contingency across the entire project to increase the available contingency budget. There are no major issues with technical progress and the schedule of deliverables remains well in advance of CERN requirements. Project highlights are listed below:

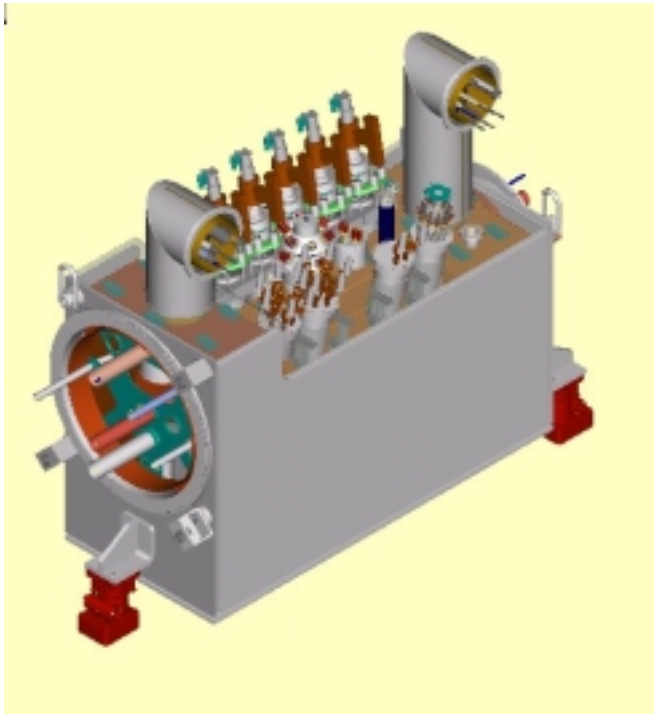
- [Fermilab] Prototype quadrupole cold mass and cryostat (Q2P1) was completed, installed on the test stand and successfully tested; design of the LQX cryo-assembly (for joining the various KEK, and Fermilab quadrupoles, and CERN-provided correction coils into complete cold mass assemblies) was approved after engineering review; monthly teleconferences have been initiated between Fermilab and KEK to plan integration of the KEK quadrupoles into the cryo-assemblies for which Fermilab is responsible.
- [BNL] Magnet production continues: all D1 separation dipoles have been wound and cured, all beam tubes received from CERN and wrapped, and the first three D1 magnets successfully collared; an interim design review of the D3 and D4 magnets has been held at CERN, and the design found to be on track.
- [LBNL] Design of DFBX cryogenic feedboxes is proceeding , with 3-D models made of all design variations; work concentrates on the most complex feedbox variant, the design for which was approved after an engineering design review at CERN; procurements for the large steel components of the TAN and TAS copper interaction region absorbers are proceeding on schedule; accelerator physics work continues on TAN vacuum chamber impedance calculations, and modeling for a CERN-proposed move of the Q2 quadrupole.

Q2P1 (MQXP01) Quench Performance



Left- First prototype quadrupole (Q2P1/MQXP01) on test -stand at Fermilab.
Recent test results of this prototype quadrupole (above) show good quench performance at 4.5K and 1.9K (Superfluid), consistent with good model magnets.

Above- Interaction Region D1 Dipole Magnet being collared at BNL.



Right- DFBX Feedbox for Interaction Region being designed at LBNL.

CERN Direct Purchases - DOE reimburses CERN for their payments to qualified U.S. vendors [Reference U.S.-CERN Agreement and Accelerator Protocol]. The status is shown in Table 5.1.

Table 5.1, Status of DOE Payments (in $000)

Contract Item	Company (U.S. supplier)	Amount Paid	Contract Price	w/ options & escalation
Niobium-Titanium Alloy Bars	Wah Chang	18,238	38,667	48,431
Niobium Sheets	Wah Chang	2,506	5,633	6,951
Polyamide Insulation Film	Kaneka High Tech Materials	659	5,425	6,510
Superconducting Cable	IGC Advanced Superconductors	1,151	16,447	20,985
LHC BPMS Button Feedthroughs	Ceramaseal	0	898	1,003
Cryogenic Temperature Sensor	Lakeshore	167		
Cryogenic Helium Mass Flowmeters	(tbd-contract in process)	0	1,200	1,200
(tbd-contract in process)	(tbd-contract in process)	0	(tbd)	3,134
Totals		22,721	68,270	88,214

6. FINANCIAL/COST STATUS AND PLANS

TOTAL PROJECT FUNDING PLAN (then year millions of dollars)*

Fiscal Year	FY96	FY97	FY98	FY99	FY00	FY01	FY02	FY03	FY04	FY05	Total
Machine Funding Profiles (DOE)											
US LHC	2.00	6.67	14.00	15.40	24.92	9.36	14.20	11.20	8.33	3.92	110
CERN Direct	0.00	0.00	0.00	8.09	8.29	17.88	8.00.	10.90	21.00	15.84	90
Machine Total	2.00	6.67	14.00	23.49	33.21	27.24	22.2	22.1	29.33	19.76	200
Detector Funding Profiles (DOE and NSF)											
US ATLAS	1.70	3.71	10.05	25.63	28.43	26.77	21.85	25.89	14.69	5.03	163.75
DOE	1.70	3.71	10.05	9.00	16.49	14.48	9.2	18.6	14.69	5.03	102.95
NSF	0.00	0.00	0.00	16.63	11.94	12.29	12.65	7.29	0.00	0.00	60.80
US CMS	2.30	4.62	10.95	38.03	24.26	21.23	21.81	21.73	15.98	6.34	167.25
DOE	2.30	4.62	10.95	32.51	20.30	17.15	17.6	19.3	15.98	6.34	147.05
NSF	0.00	0.00	0.00	5.52	3.96	4.08	4.21	2.43	0.00	0.00	20.20
Detectors Total	4.00	8.33	21.00	63.66	52.69	50.07	55.66	45.72	29.87	0.00	331.00

TOTAL DOE & NSF FUNDS, COSTS, & COMMITMENTS (cumulative $000)†

U.S. LHC Construction Project	A = Funds Allocated	B = Estimate Actual Costs	C = Open Commitments	D= B+C Total	A–D = Funds Available
U.S. ATLAS	96,290	53,587	8,626	62,213	34,077
U.S. CMS	101,390	64,554	15,948	80,502	20,888
U.S. LHC Accelerator	72,350	62,698	3,856	66,554	5,796
CERN Direct Purchases	34,260	22,721	0	22,721	11,539
Total	304,290	203,560	28,430	231,990	72,300

* This report includes a revision to the funding profile for the U.S. LHC Construction Project that is addressed in the FY 2002 budget planning for DOE. The revision better matches the needs of the construction projects. This report also includes a change in the distribution of funds between the U.S. LHC Accelerator project and the CERN direct project to address delays in CERN invoices.

† Based on financial reports from the U.S. LHC construction projects. NSF funding is provided after the beginning of the fiscal year and therefore it is necessary to carry-over funding into the subsequent fiscal years.

7. DOE/NSF COST BASELINES AT LEVEL 2 (in $000)

U.S. ATLAS Cost Baseline

WBS	Description	Previous	Change	Current
1.1	Silicon System	18,718	-963	17,755
1.2	Transition Radiation Tracker	9,079	115	9,194
1.3	Liquid Argon Calorimeter	40,972	1,199	42,171
1.4	Tile Calorimeter	7,929	1,219	9,148
1.5	Muon Spectrometer	24,103	2,288	26,391
1.6	Trigger/Data Acquisition System	10,957	0	10,957
1.7	Common Projects	9,179	0	9,179
1.8	Education	287	0	287
1.9	Project Management	7,778	502	8,280
1.10	Technical Coordination	0	450	450
	Contingency	34,748	-4,810	29,938
	U.S. ATLAS Total Project Cost Baseline	163,750	0	163,750

U.S. CMS Cost Baseline

WBS	Description	Previous	Change	Current
1.1	Endcap Muon	35,014	981	35,995
1.2	Hadron Calorimeter	37,890	446	38,336
1.3	Trigger and Data Acquisition	13,431	288	13,719
1.4	Electromagnetic Calorimeter	9,314	250	9,564
1.5	Forward Pixels	6,435	321	6,756
1.6	Common Projects	23,000	0	23,000
1.7	Project Office	7,243	287	7,530
1.8	Silicon	3,041	284	3,325
	Contingency	31,882	- 2,857	29,025
	U.S. CMS Total Project Cost Baseline	167,250	0	167,250

U.S. LHC Accelerator Cost Baseline[1]

WBS	Description	Previous	Change	Current
1.1	Interaction Region Components	50,328	0	50,328
1.2	Radio Frequency Straight Section	15,714	0	15,714
1.3	Superconducting Wire and Cable	11,868	0	11,868
1.4	Accelerator Physics	5,133	0	5,133
1.5	Project Management	13,612	0	13,612
	Contingency	13,345	0	13,345
	U.S. LHC Accelerator Total Project Cost Baseline	110,000	0	110,000

[1] Changes pending

8. SCHEDULE STATUS AND PLANS

8.1 U.S. ATLAS Construction Project Milestones (Baseline changes in the current Quarter are bold)

U.S. ATLAS Major Project Milestones (Level 1)

Description	Baseline Schedule	Forecast (F) Date	Actual (A) Date
Project Start	01-Oct-95	01-Oct-95 (F)	01-Oct-95 (A)
Project Completion	30-Sep-05	30-Sep-05 (F)	

U.S. ATLAS Major Project Milestones (Level 2)

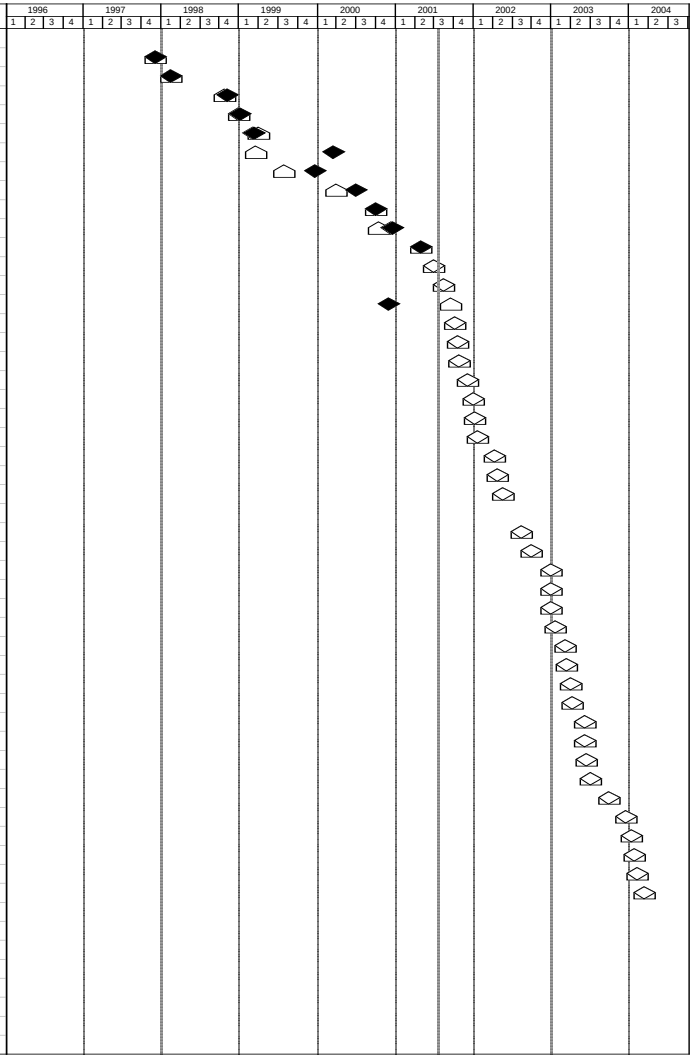
Subsystem	Schedule Designator	Description	Baseline Schedule	Forecast (F) / Actual (A) Date
Silicon (1.1)	SIL L2/1	Start Full Silicon Strip Electronics Production	**06-Jul-01**	06-Jul-01 (F)
	SIL L2/2	Start Full Strip Module Production	**07-Jan-02**	07-Jan-02 (F)
	SIL L2/3	ROD Design Complete	**01-Oct-01**	01-Oct-01 (F)
	SIL L2/4	Complete Shipment of Silicon Strip Module Production	13-Oct-03	13-Oct-03 (F)
	SIL L2/5	ROD Production/Testing Complete	**24-Jun-03**	24-Jun-03 (F)
TRT (1.2) Mechanical	TRT L2/1	Final Design Complete	31-Dec-98	07-Dec-98 (A)
	TRT L2/2	Module Production Complete (CUM 102)	**31-Mar-03**	31-Mar-03 (F)
	TRT L2/3	Barrel Construction Complete	16-Sep-03	16-Sep-03 (F)
Electrical	TRT L2/4	Select Final Elec Design	15-Jun-01	30-Aug-00 (A)
	TRT L2/5	Start Production of ASICS	**18-Jan-02**	18-Jan-02 (F)
	TRT L2/6	Installation Complete	04-Jan-05	04-Jan-05 (F)
LAr Cal (1.3)	LAr L2/1	Cryostat Contract Award	24-Jul-98	05-Aug-98 (A)
	LAr L2/2	Barrel Feedthroughs Final Design Review	30-Sep-98	02-Oct-98 (A)
	LAr L2/3	Start Electronics Production (Preamps)	30-Jun-00	30-Jun-00 (A)
	LAr L2/4	FCAL Mechanical Design Complete	14-Dec-98	15-Dec-99 (A)
	LAr L2/5	FEB SCA Prod. Chip Submission/Contract Award	**19-Jul-01**	19-Jul-01 (F)
	LAr L2/6	Level 1 Trigger Final Design Complete	**04-Oct-01**	04-Oct-01 (F)
	LAr L2/7	ROD Final Design Complete	**12-Dec-02**	12-Dec-02 (F)
	LAr L2/8	Motherboard System Production Complete	**30-Jun-02**	30-Jun-02 (F)
	LAr L2/9	Cryostat Arrives at CERN	15-May-01	15-May-01 (F)
	LAr L2/10	Barrel Feedthroughs Production Complete	**15-Feb-02**	15-Feb-02 (F)
	LAr L2/11	FCAL-C Delivered to EC	17-Oct-02	17-Oct-02 (F)
	LAr L2/12	FCAL-A Delivered to EC	08-Dec-03	08-Dec-03 (F)

U.S. ATLAS Major Project Milestones (Level 2) (Continued)

Subsystem	Schedule Designator	Description	Baseline Schedule	Forecast (F) / Actual (A) Date
Tile Cal (1.4)	Tile L2/1	Start Submodule Procurement	01-Sep-97	01-Sep-97 (A)
	Tile L2/2	Technology Choice for F/E Electronics	15-Nov-97	15-Nov-97 (A)
	Tile L2/3	Start Module Construction	01-May-99	20-Sep-99 (A)
	Tile L2/4	Start Production of Motherboards	**01-Apr-01**	01-Apr-01 (F)
	Tile L2/5	All Electronic Components Delivered to CERN	01-Oct-02	01-Oct-02 (F)
	Tile L2/6	Module Construction Complete	30-Sept-02	30-Sep-02 (F)
	Tile L2/7	All Modules Delivered to CERN	**02-Dec-02**	02-Dec-02 (F)
Muon (1.5)	Muon L2/1	Start MDT Chambers Lines 1 and 3	17-Jul-00	15-Sep-00 (A)
	Muon L2/2	Start CSC Chamber Production	**01-Sep-01**	01-Sep-01 (F)
	Muon L2/3	MDT Electronics ASD PRR	19-Oct-01	01-Oct-01 (F)
	Muon L2/4	Final Design of Global Alignment Devices Complete	01-Apr-02	01-Apr-02 (F)
	Muon L2/5	CSC IC Production Complete	**15-May-02**	15-May-02 (F)
	Muon L2/6	Kinematic Mount Design Complete	30-Jan-01	30-Jan-01 (A)
	Muon L2/7	MDT Chambers (U.S.) Production Complete	**27-Aug-04**	27-Aug-04 (F)
	Muon L2/8	Kinematic Mount Production Complete	**24-May-04**	24-May-04 (F)
	Muon L2/9	CSC ROD Production Complete	05-Nov-03	05-Nov-03 (F)
	Muon L2/10	MDT Elec.'s Mezzanine Production Complete	**06-Mar-03**	06-Mar-03 (F)
	Muon L2/11	CSC Assembly/Testing at CERN Complete	17-Dec-04	17-Dec-04 (F)
	Muon L2/12	Global Alignment System Final Delivery	30-Sep-04	30-Sep-04 (F)
Trigger/ DAQ (1.6)	TDAQ L2/1	Select Final LVL2 Architecture	31-Dec-99	31-Mar-00 (A)
	TDAQ L2/2	LVL2 Trigger Design Complete	**31-Dec-02**	31-Dec-02 (F)
	TDAQ L2/3	LVL2 Trigger Prototype Complete	**30-Sep-02**	30-Sep-02 (F)
	TDAQ L2/4	Start Production	**08-Jan-03**	08-Jan-03 (F)
	TDAQ L2/5	Start Installation & Commissioning	**05-Mar-03**	05-Mar-03 (F)
	TDAQ L2/6	Production Complete	**30-Jul-05**	30-Jul-05 (F)
	TDAQ L2/7	LVL2 Installation & Commissioning Complete	**30-Sep-05**	30-Sep-05 (F)

Figure 8.1.1 U.S. ATLAS Milestone Schedule Status Report

ID	Subsystem ID	Milestone	ETC 01 Baseline	Forecast	Actual
1		Project Start (10/1/95)	10/1/95	10/1/95	10/1/95
2	Tile L2/1	Start Submodule Procurement	9/1/97	9/1/97	9/1/97
3	Tile L2/2	Technology Choice for F/E Electronics	11/15/97	11/15/97	11/15/97
4	LAr L2/1	Cryostat Contract Award	7/24/98	8/5/98	8/5/98
5	LAr L2/2	Barrel FTs Final Design Review	9/30/98	10/2/98	10/2/98
6	TRT L2/1	Final Design Complete	12/31/98	12/7/98	12/7/98
7	LAr L2/4	FCAL Mech Design Complete	12/14/98	12/15/99	12/15/99
8	Tile L2/3	Start Module Construction	5/1/99	9/20/99	9/20/99
9	TDAQ L2/1	Select Final LVL2 Architecture	12/31/99	3/31/00	3/31/00
10	LAr L2/3	Start Elec.'s Production (Preamps)	6/30/00	6/30/00	6/30/00
11	Muon L2/1	Start MDT Chambers Lines 1 & 3	7/17/00	9/15/00	9/15/00
12	Muon L2/6	Kinematic Mount Design Complete	1/30/01	1/30/01	1/30/01
13	Tile L2/4	Start Production of MBs	**4/1/01**	4/1/01	NA
14	LAr L2/9	Cryostat Arrives at CERN	5/15/01	5/15/01	NA
15	TRT L2/4	Select Final Elec Design	6/15/01	8/30/00	8/30/00
16	Sil L2/1	Start Full Silicon Strip Elec Production	**7/6/01**	7/6/01	NA
17	LAr L2/5	FEB SCA Prod Chip Submission/CA	**7/19/01**	7/19/01	NA
18	**Sil L2/6**	**Pixels '1st IBM Prototype Submitted'**	**7/26/01**	**7/26/01**	NA
19	Muon L2/2	Start CSC Chamber Production	**9/1/01**	9/1/01	NA
20	Sil L2/3	ROD Design Complete	**10/1/01**	10/1/01	NA
21	LAr L2/6	Level 1 Trigger Final Design Complete	**10/4/01**	10/4/01	NA
22	Muon L2/3	MDT Electronics ASD PRR	10/19/01	10/19/01	NA
23	Sil L2/2	Start Full Strip Module Production	**1/7/02**	1/7/02	NA
24	TRT L2/5	Start Production of ASICS	**1/18/02**	1/18/02	NA
25	LAr L2/10	Barrel FTs Production Complete	**2/15/02**	2/15/02	NA
26	Muon L2/4	Final Design of Global Align Devices	4/1/02	4/1/02	NA
27	Muon L2/5	CSC IC Production Complete	**5/15/02**	5/15/02	NA
28	LAr L2/8	MB System Production Complete	**6/30/02**	6/30/02	NA
29	TDAQ L2/3	LVL2 Trigger Prototype Complete	**9/30/02**	9/30/02	NA
30	Tile L2/6	Module Construction Complete	9/30/02	9/30/02	NA
31	Tile L2/5	All Elec.'s Components Delivered to ATLAS	10/1/02	10/1/02	NA
32	LAr L2/11	FCAL-C Delivered to EC	10/17/02	10/17/02	NA
33	Tile L2/7	All Modules Delivered to CERN	**12/2/02**	12/2/02	NA
34	LAr L2/7	ROD Final Design Complete	**12/12/02**	12/12/02	NA
35	TDAQ L2/2	LVL2 Trigger Design Complete	**12/31/02**	12/31/02	NA
36	TDAQ L2/4	Start Production	**1/8/03**	1/8/03	NA
37	TDAQ L2/5	Start Installation & Commissioning	**3/5/03**	3/5/03	NA
38	Muon L2/10	MDT Elec.'s Mezz Production Complete	**3/6/03**	3/6/03	NA
39	**Sil L2/7**	**Pixels 'Start IBM Production'**	**3/13/03**	**3/13/03**	NA
40	TRT L2/2	Module Production Complete (CUM 102)	**3/31/03**	3/31/03	NA
41	Sil L2/5	ROD Production/Testing Complete	**6/24/03**	6/24/03	NA
42	TRT L2/3	Barrel Construction Complete	9/16/03	9/16/03	NA
43	Sil L2/4	Compl Shipment of Silicon Strip Modules Prod	10/13/03	10/13/03	NA
44	**Sil L2/8**	**Pixels 'Start IBM Outer Bare Module Prod'**	**10/22/03**	**10/22/03**	NA
45	Muon L2/9	CSC ROD Production Complete	11/5/03	11/5/03	NA
46	LAr L2/12	FCAL-A Delivered to EC	12/8/03	12/8/03	NA
47	Muon L2/8	Kinematic Mount Production Complete	**5/24/04**	5/24/04	NA
48	Muon L2/7	MDT Chambers (U.S.) Prod Compl (Qty. 240)	**8/27/04**	8/27/04	NA
49	Muon L2/12	Global Align System Final Delivery	9/30/04	9/30/04	NA
50	**Sil L2/9**	**Pixels 'Disk System at CERN'**	**10/13/04**	**10/13/04**	NA
51	Muon L2/11	CSC Assembly/Test at CERN Complete	12/17/04	12/17/04	NA
52	TRT L2/6	Installation Complete	1/4/05	1/4/05	NA
53	TDAQ L2/6	Production Complete	**7/30/05**	7/30/05	NA
54	TDAQ L2/7	Installation & Commissioning Complete	**9/30/05**	9/30/05	NA



8.2 U.S. CMS Construction Project Milestones

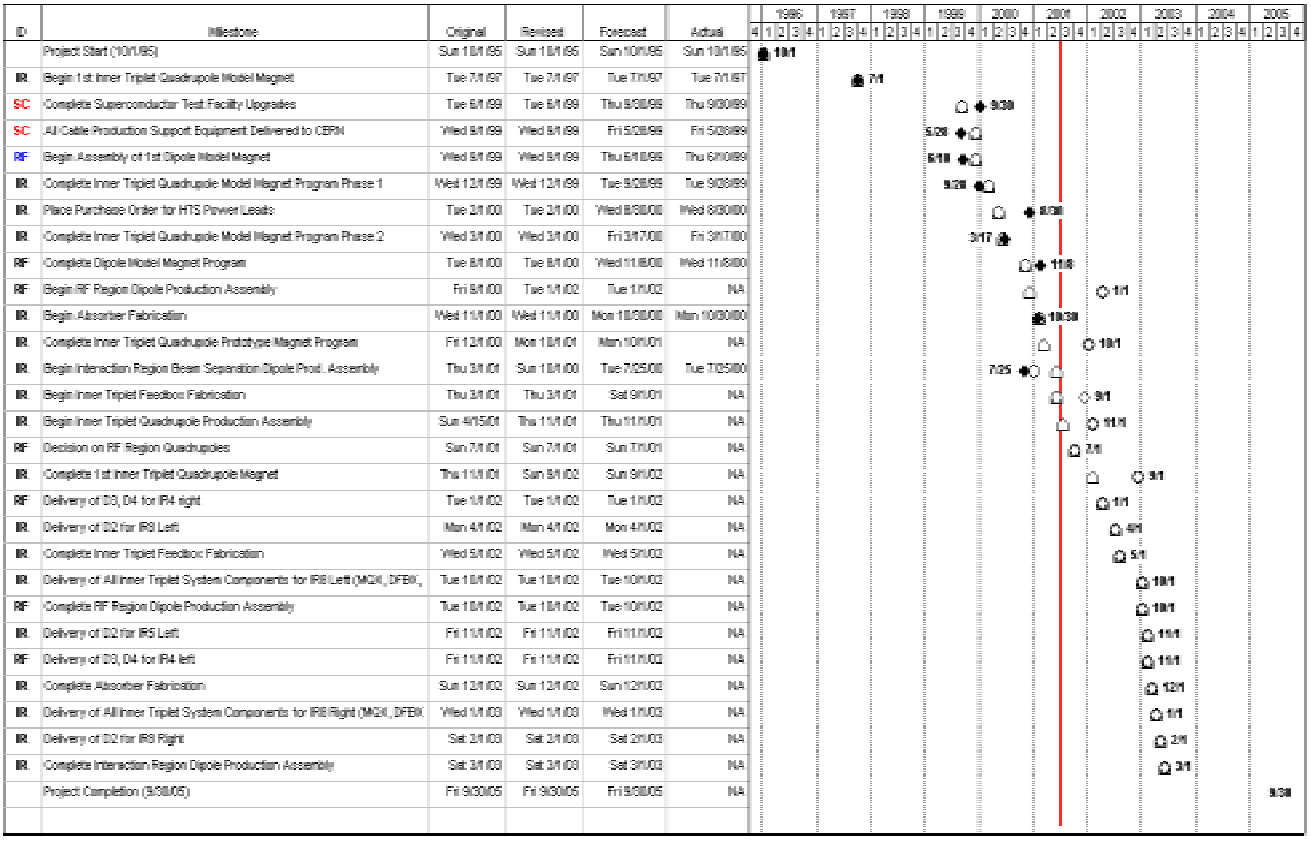
System	Level?	CMS ID	Milestone	Variance	Baseline Start	Start
			CMS L1 Milestones	**0 days**	**NA**	**Oct 31 '95**
CMS1	ML1		Project Start (10/31/95)	0 days	Oct 31 '95	Oct 31 '95
CMS1	ML1	D-014	Submit DAQ Technical Design Report (TDR)	0 days	Dec 31 '01	Dec 31 '01
CMS1	ML1	HB-017	End Assembly of HB (Barrel) in Surface Hall (SX5)	0 days	Jul 31 '02	Jul 31 '02
CMS1	ML1	HE-012	End Assembly of HE (Endcap) in SX5	0 days	Mar 31 '03	Mar 31 '03
CMS1	ML1	HB-010	End Trial Insertion of HB in Vacuum Tank	65 days	May 01 '03	Jul 31 '03
CMS1	ML1	E-015	Trial Mounting of EB Supermodule on HB Complete	0 days	Aug 31 '03	Aug 31 '03
CMS1	ML1	S-022	Close Yoke and Start Magnet Test in SX5	0 days	Sep 30 '03	Sep 30 '03
CMS1	ML1	HB-023	End Installation and Test of HB in UX5	0 days	May 31 '04	May 31 '04
CMS1	ML1	HE-015	End Installation and Test of HE in UX5	0 days	Jul 31 '04	Jul 31 '04
CMS1	ML1	E-019	End Inst., Testing, & Debug. of EB (barrel) in UX5	0 days	Oct 31 '04	Oct 31 '04
CMS1	ML1	M-019	End Install. of ME (Endcap) Stations in YE in UX5	0 days	Mar 31 '03	Mar 31 '03
CMS1	ML1	T-014	End Installation and Test of Tracker in UX5	0 days	Jun 30 '03	Jun 30 '03
CMS1	ML1	HF-025	End Installation and Test of HF in UX5	0 days	Jun 30 '03	Jun 30 '03
CMS1	ML1		Project Completion (S/C903)	0 days	Sep 30 '03	Sep 30 '03
			Muon System (WBS 1.1)	**0 days**	**NA**	**Dec 02 '98**
MUON	ML2	M-009	Mechanical Engineering Design Review	-14 days	Dec 31 '98	Dec 02 '98
MUON	ML2	M-010	Begin Mass Production of CSC Parts (panels)	21 days	Apr 30 '99	May 31 '99
MUON	ML2	M-011	Begin Assembly of Cathode Strip Chambers at FNAL	173 days	Oct 31 '99	Jul 14 '00
MUON	ML2	M-012	Pre-Production ASIC's Ready	164 days	Nov 30 '99	Aug 01 '00
MUON	ML2	M-013	Begin Mass Production of Electronics Boards	88 days	Aug 31 '00	Jan 04 '01
MUON	ML2	M-014	Begin Mounting Electronics and Testing at UCLA/UF	185 days	Sep 30 '00	Jun 28 '01
MUON	ML2	M-015	Begin CSC Assembly PNPI(St. Petersburg) & JINR(Dubna)	87 days	Jan 31 '01	Jun 01 '01
MUON	ML2	M-016	50% of the Chambers Installed	0 days	Jul 31 '03	Jul 31 '03
MUON	ML2	M-017	All Large Chambers Assembled and Tested	0 days	Oct 31 '03	Oct 31 '03
MUON	ML2	M-018	All Chambers Installed	0 days	Mar 31 '04	Mar 31 '04
			HCAL System (WBS 1.2)	**0 days**	**NA**	**Oct 02 '98**
HCAL	ML2	HB-030	HB: 5995 Absorber Delivered to CERN	-21 days	Oct 31 '98	Oct 02 '98
HCAL	ML2	HB-001	HB: Mechanical Engineering Design Review	-19 days	Nov 30 '98	Nov 03 '98
HCAL	ML2	HB-032	HB: 5992 Absorber Delivered to CERN	-9 days	Apr 30 '99	Apr 15 '99
HCAL	ML2	HO-001	HO Engineering Design Review	-4 days	Jun 01 '99	Jun 02 '99
HCAL	ML2	HE-001	HE Mechanical Engineering Design Review	-71 days	Sep 30 '99	Jun 12 '99
HCAL	ML2	HF-006	HF Engineering Design Review Complete	208 days	Oct 31 '00	Aug 31 '01

System	Level?	CMS ID	Milestone	Variance	Baseline Start	Start
HCAL	ML2	HB-010	HB-1 Absorber Delivered to CERN	0 days	Nov 30 '00	Nov 30 '00
HCAL	ML2	HF-028	HF: Define Fiber Diameter	0 days	Jan 31 '01	Jan 31 '01
HCAL	ML2	HB-039	Complete Front-end Electronics Production	257 days	Jan 30 '01	Oct 31 '02
HCAL	ML2	HB-014	HB+1 Absorber Delivered to CERN	0 days	Dec 31 '01	Dec 31 '01
HCAL	ML2	HO-003	HO Optics Installation on YB Completed	0 days	Jan 30 '03	Jan 30 '03
HCAL	ML2	HB-021	HB: End Installation in Solenoid in UX5	73 days	Dec 01 '03	Mar 31 '04
HCAL	ML2	HO-007	HO End Installation and Tests in UX5	0 days	Apr 30 '03	Apr 30 '03
			Trifas System (WBS 1.3)	**0 days**	**NA**	**Nov 03 '98**
TRIG	ML2	D-001	Complete Initial Muon, Calorimeter, & Global Trigger Desig	-19 days	Nov 30 '98	Nov 03 '98
DAQ	ML2	D-003	Readout Unit Prototype 2 (Design of)	0 days	May 18 '99	May 18 '99
DAQ	ML2	D-006	Event Builder Prototype 1 Complete	-19 days	May 31 '99	May 04 '99
TRIG	ML2	D-002	Complete Phase 1 Prototype Design	-28 days	Nov 30 '99	Nov 02 '99
DAQ	ML2	D-007	Readout Unit Prototype 2 Complete	-28 days	Nov 30 '99	Nov 02 '99
DAQ	ML2	D-008	Filter Unit Prototype 1 Complete	-28 days	Nov 30 '99	Nov 02 '99
CMS1	ML1	D-004	Submit Trigger Technical Design Report (TDR)	0 days	Nov 30 '00	Nov 30 '00
DAQ	ML2	D-009	Vertical DAQ Chain Prototype Complete	-28 days	Nov 30 '99	Nov 02 '99
DAQ	ML2	D-010	High Level Trigger Prototype 1 Complete	-28 days	Nov 30 '99	Nov 02 '99
DAQ	ML2	D-011	Full DAQ Prototype Tests Complete	44 days	May 01 '00	Jun 30 '00
DAQ	ML2	D-013	Technologies Choice Preparation: end 1.9 DAQ	21 days	Nov 01 '00	Nov 30 '00
			ECAL system (WBS 1.4)	**0 days**	**NA**	**Jun 01 '98**
ECAL	ML2	E-001	Choice of Avalanche Photodiodes	-21 days	Jun 30 '98	Jun 01 '98
ECAL	ML2	E-004	500 Electronics Channels Test	308 days	Dec 31 '99	Dec 31 '01
ECAL	ML2	E-006	Module 0 (400 channels) Prototype Complete	421 days	Dec 31 '99	Aug 31 '01
ECAL	ML2	E-008	Supermodule 1 Completed	453 days	Jan 30 '00	Mar 31 '02
ECAL	ML2	E-011	Supermodule 1 Calibration and Testing Complete	148 days	Aug 31 '01	Mar 31 '02
ECAL	ML2	E-013	Half Barrel (18 Supermodules) Calibrated	0 days	Sep 30 '02	Sep 30 '02
ECAL	ML2	E-017	Full Barrel (36 Supermodules) Completed	0 days	Jun 30 '04	Jun 30 '04
			PIXEL System (WBS 1.5)	**0 days**	**NA**	**Dec 01 '98**
PIXE	ML2	T-012	Define construction milestones up to 2000	301 days	Jul 01 '99	Jun 30 '01
PIXE	ML2	T-001	Final Full Size Sensor - Submission	129 days	Jan 31 '01	Jul 31 '01
PIXE	ML2	T-002	Final Full Size Readout Chip - Submission	316 days	Feb 28 '01	May 31 '02
			Common Projects (WBS 1.6)	**0 days**	**NA**	**Jun 30 '99**
	ML2		*Baseline Milestone Symbol (CMS P27 Schedule)*	*0 days*	*NA*	*Oct 02 '00*
	ML2		*Projected Milestone Symbol*	*0 days*	*NA*	*Oct 02 '00*
cc	*ML2*		*Achieved Milestone Symbol*	*0 days*	*NA*	*Oct 02 '00*

8.3 U.S. LHC Accelerator Construction Project Milestones

Table 8.3 Level 2 U.S. LHC Accelerator Baseline Milestones through FY2001

WBS Identifiers	Milestone Description	Baseline Date	Forecast(F) or Actual(A)
Int Region	Begin 1st inner triplet quadrupole model magnet	1 Jul 97	1 Jul 97 (A)
Int Region	Complete inner triplet quadrupole model magnet program phase 1	1 Dec 99	28 Sep 99 (A)
Int Region	Complete inner triplet quadrupole model magnet program phase 2	1 Mar 00	17 Mar 00 (A)
Int Region	Place purchase order for HTS power leads	1 Feb 00	30 Aug 00 (A)
Int Region	Begin absorber fabrication	1 Nov 00	30 Oct 00 (A)
Int Region	Complete inner triplet quadrupole prototype magnet program	1 Oct 01	1 Oct 01 (F)
Int Region	Begin interaction region beam separation dipole production assembly	1 Oct 00	25 Jul 00 (A)
Int Region	Begin inner triplet feedbox fabrication	1 Mar 01	**1 Sep 01 (F)**
RF Region	Begin assembly of 1st dipole model magnet	1 Sep 99	10 Jun 99 (A)
RF Region	Complete dipole model magnet program	1 Aug 00	8 Nov 00 (A)
SC Cable	All cable production support equipment delivered to CERN	1 Sep 99	28 May 99 (A)
SC Cable	Complete SC testing facility upgrades	1 Jun 99	30 Sep 99 (A)



Original baseline Revised baseline Forecast Actual

9. TECHNICAL BASELINE STATUS

U.S. ATLAS Construction Project - No change. The U.S. ATLAS collaboration defined a list of initial deliverables representing the U.S. contribution to ATLAS. This list was approved by the JOG in March 1998. Deliverables are listed in the U.S. ATLAS Construction Project Management Plan, Appendix 3.

U.S. CMS Construction Project - Change to incorporate expanded U.S. CMS participation in the CMS Silicon Tracker Outer Barrel, per approved Level 2 Change Request defining additional associated deliverables, milestones, cost and schedule. The U.S. CMS collaboration defined a list of deliverables representing the U.S. contribution to CMS. This list was approved by the JOG in October 1998. The scope of U.S. CMS contribution is described in the U.S. CMS Management Plan, Appendix 2.

U.S. LHC Accelerator Construction Project - No change. U.S. LHC Accelerator Project - The U.S. deliverables to CERN are defined in the Implementing Arrangement to the Accelerator Protocol. The Implementing Arrangement was signed by the CERN and U.S. signatories in July 1998. Reference the U.S. LHC Accelerator Project Management Plan, Annex II, (Approved 6/15/98).

CERN Direct Purchases - No change. CERN will procure from U.S. industrial firms supplies required to construct the LHC accelerator. These supplies will include superconducting alloy, cable, insulation, and other materials.

10. BASELINE CHANGE ACTIVITY

Baseline Control Level	Baseline Changes
Level 1, DOE/NSF Joint Oversight Group	No changes this quarter.
Level 2, DOE/NSF Project Office	
U.S. ATLAS	Changes to the Level 2 cost and schedule baseline.
U.S. CMS	Changes to the Level 2 cost, scope and schedule baseline.
U.S. LHC Accelerator	No changes this quarter.

APPENDIX A - FUNDING BY INSTITUTION (in thousands of dollars)

U.S. CMS Construction Project

	FY 1998				FY 1999				FY 2000				
	DOE				DOE				DOE				Grand
Institution	Grant	Contract	NSF	Total	Grant	Contract	NSF	Total	Grant	Contract	NSF	Total	Total
FNAL	0	5,517	0	5,517	0	10,817	40	10,857	0	5,981	0	5,981	22,355
Fairfield	0	29	0	29	0	0	0	0	0	10	0	10	39
Maryland	90	65	0	155	0	132	131	263	0	250	0	250	668
Boston U.	0	32	0	32	31	111	0	142	0	132	0	132	306
Florida State	60	54	0	114	71	118	0	189	80	54	0	134	437
U. of Minnesota	60	95	0	155	161	452	0	613	141	202	0	343	1,111
U. of Iowa	77	62	0	139	20	5	0	25	0	453	0	453	617
U. of Rochester	127	1,159	0	1,286	262	485	0	747	441	253	0	694	2,727
Notre Dame	0	52	0	52	0	44	184	228	0	14	193	207	487
Purdue	38	135	0	173	49	166	0	215	0	175	0	175	563
U. of Miss.	46	100	0	146	68	91	0	159	69	108	0	236	541
U. of Florida	44	95	0	139	184	412	0	596	333	853	0	1,186	1,921
Ohio State U.	140	64	0	204	275	212	0	487	196	732	0	928	1,619
Carnegie Mellon	0	113	0	113	0	291	0	291	0	312	0	312	716
Rice	138	19	0	157	102	56	0	158	132	16	0	148	463
U. of Wisconsin	533	1,052	0	1,585	471	3,598	0	4,069	459	3,197	0	3,656	9,310
U.C. Davis	34	100	0	134	0	78	0	78	263	502	0	765	977
UCLA	150	87	0	237	249	173	0	422	244	391	0	635	1,294
U.C. Riverside	20	10	0	30	0	164	0	164	0	70	0	70	264
John Hopkins	0	29	0	29	0	0	70	70	0	0	40	40	139
Northwestern	0	59	0	59	5	26	0	31	0	114	0	114	204
Rutgers	0	13	0	13	0	0	34	34	0	2	140	142	189
Princeton	0	256	0	256	0	626	0	626	0	667	0	667	1,549
Caltech	0	148	0	148	0	458	0	458	0	367	0	367	973
U.C. San Diego	11	0	0	11	11	90	24	125	36	0	0	36	172
Northeastern	0	0	0	0	0	0	3,370	3,370	0	0	1,741	1,741	5,111
U. Ill.-Chicago	0	0	0	0	0	0	124	124	0	0	309	309	433
U. of Nebraska	0	0	0	0	0	0	24	24	0	0	2	2	26
MIT	0	37	0	37	15	67	0	82	0	78	0	78	197
Iowa State	0	0	0	0	0	0	19	19	0	356	0	356	375
Subtotal	1,568	9,382	0	10,950	1,974	18,672	4,020	24,666	2,394	15,289	2,425	20,167	55,783
Reserve	0	0	0	0	0	3,401	1,524	4,925	0	0	0	0	0
Total	1,568	9,382	0	10,950	1,974	22,073	5,544	29,591	2,394	15,289	2,425	20,167	55,783

U.S. ATLAS Construction Project

	FY 1998				FY 1999				FY 2000				
	DOE				DOE				DOE				Grand
Institution	Grant	Contract	NSF	Total	Grant	Contract	NSF	Total	Grant	Contract	NSF	Total	Total
ANL	0	1,098	0	1,098	0	967	0	967	0	922	0	922	2,987
BNL	0	3,903	0	3,903	0	2,581	0	2,581	0	6,429	0	6,429	12,913
LBNL	0	633	0	633	0	715	0	715	0	420	0	420	1,768
SUNY/Albany	20	0	0	20	48	0	0	48	50	0	0	50	118
U. of Arizona	320	100	0	420	634	0	0	634	557	0	0	557	1,611
Boston U.	224	0	0	224	298	0	0	298	287	0	0	287	809
Brandeis U.	265	45	0	310	0	0	593	593	0	0	478	478	1,381
U.C.Irvine	193	0	0	193	0	0	93	93	0	0	0	0	286
U.C. SantaCruz	404	0	0	404	63	0	0	63	0	0	568	568	1,035
U. of Chicago	0	54	0	54	0	0	1,069	1,069	0	0	264	264	1,387
Duke U.	190	0	0	190	601	0	0	601	417	0	0	417	1,208
Hampton U.	0	0	0	0	0	0	538	538	0	0	293	293	831
Harvard	234	0	0	234	0	0	654	654	0	0	390	390	1,278
U. of Illinois	50	159	0	209	347	0	0	347	294	0	0	294	850
Indiana U.	190	0	0	190	765	0	0	765	460	0	0	460	1,415
MIT	50	0	0	50	105	0	0	105	177	0	0	177	332
Michigan State	0	35	0	35	0	0	178	178	0	0	293	293	506
Nevis/Columbia	0	675	0	675	0	0	2,680	2,680	0	0	1,422	1,422	4,777
U. of New Mex.	20	0	0	20	30	0	0	30	24	0	0	24	74
Northern Illinois	0	0	0	0	0	0	0	0	0	0	0	0	0
Ohio State U.	0	0	0	0	100	0	0	100	45	0	0	45	145
U. of Michigan	62	254	0	316	716	0	0	716	518	0	0	518	1,550
U. of Oklahoma	30	0	0	30	0	0	41	41	0	0	51	51	122
U. of Penn.	250	0	0	250	300	0	0	300	265	0	0	265	815
U. of Pittsburg	110	0	0	110	0	0	150	150	0	0	210	210	470
U. of Rochester	0	0	0	0	0	0	3,587	3,587	0	0	1,664	1,664	5,251
U.T. Arlington	50	82	0	132	0	0	474	474	0	0	230	230	836
S. Methodist	40	0	0	40	124	0	0	124	30	0	0	30	194
SUNY/Stony B.	27	0	0	27	0	0	1,045	1,045	0	0	1,037	1,037	2,109
Tufts University	50	0	0	50	20	0	0	20	20	0	0	20	90
U. Washington	0	0	0	0	0	0	240	240	0	0	318	318	558
U. of Wisconsin	230	0	0	230	429	0	0	429	665	0	0	665	1,324
Subtotal	3,009	7,038	0	10,047	4,580	4,263	11,342	20,185	3,809	7,771	7,218	18,798	49,030
Reserve	0	3	0	3	157	0	5,289	5,446	327	1,936	1,795	4,058	4,058
									0	2,602	2,928	5,530	
Total	3,009	7,041	0	10,050	4,737	4,263	16,631	25,631	4,136	12,309	11,941	28,386	53,088